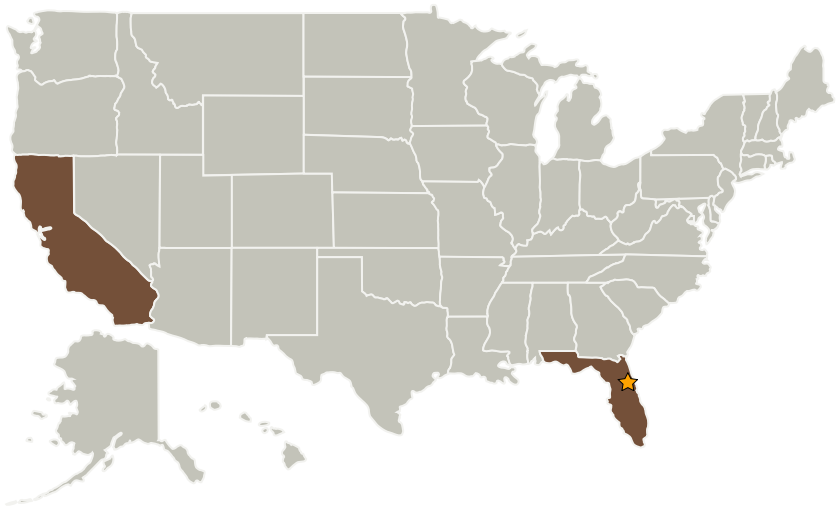
Microchannel Reactors for ISRU Applications Using Nanofabricated Catalysts, Phase I

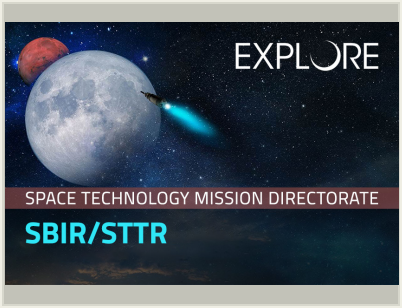
Completed Technology Project (2005 - 2005)

Project Introduction

Makel Engineering, Inc. (MEI) and USRA propose to develop microchannel reactors for In-Situ Resources Utilization (ISRU) using nanofabricated catalysts. The proposed technology seeks to develop and demonstrate an exoskeletal support concept using carbon nanotubes (CNT) as catalyst support within microchannel reactors. Affordable planning and execution of prolonged manned space missions depend upon the utilization of local resources and the waste products which are formed in manned spacecraft and surface bases. Successful ISRU will require component technologies which provide optimal size, weight, volume, and power efficiency. The use of advanced CNT supported catalysts within the microchannel reactor structure will enable the efficient chemical processing of in-situ resources. The reactors can be designed for the processes that generate the most benefit for each mission. For instance, propellants (methane) can be produced from carbon dioxide from the Mars atmosphere using the Sabatier reaction and ethylene can be produced from the partial oxidation of methane. Ethylene is a feedstock for systems to synthesize ethanol and polyethylene. Polyethylene can be used in the construction of habitats, tools, and replacement parts. Ethanol can be used as a nutrient for Astrobiology experiments, as well as a precursor for the production of nutrients (e.g. sugars) for human crew.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
Makel Engineering, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Chico, California

Primary U.S. Work Locations	
California	Florida

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Darby Makel

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.4 Resource Processing for Production of Manufacturing, Construction, and Energy Storage Feedstock Materials